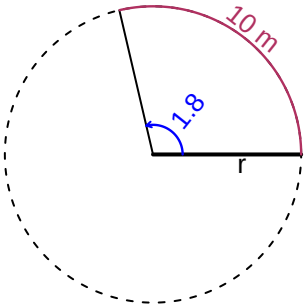
Name: Date:

Trig Final (SLTN v609)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 1.8 radians. The arc length is 10 meters. How long is the radius in meters?

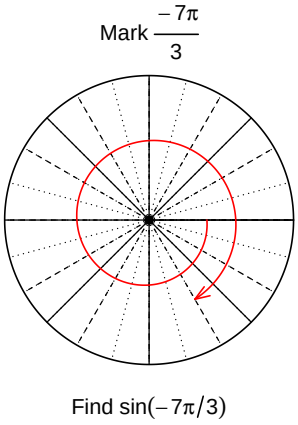


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

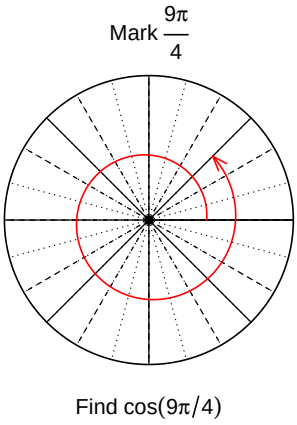
$r = 5.556$ meters.

Question 2

Consider angles $\frac{-7\pi}{3}$ and $\frac{9\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{-7\pi}{3}\right)$ and $\cos\left(\frac{9\pi}{4}\right)$ by using a unit circle (provided separately).



Find $\sin(-7\pi/3)$



Find $\cos(9\pi/4)$

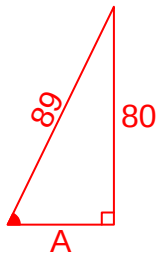
$\sin(-7\pi/3) = \frac{-\sqrt{3}}{2}$

$\cos(9\pi/4) = \frac{\sqrt{2}}{2}$

Question 3

If $\sin(\theta) = \frac{-80}{89}$, and θ is in quadrant IV, determine an exact value for $\tan(\theta)$.

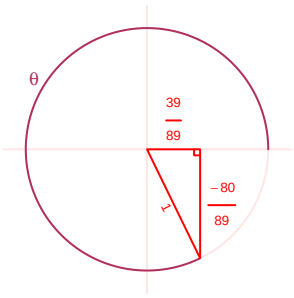
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$A^2 + 80^2 = 89^2$$
$$A = \sqrt{89^2 - 80^2}$$
$$A = 39$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant IV in a unit circle.



$$\tan(\theta) = \frac{\frac{-80}{89}}{\frac{39}{89}} = \frac{-80}{39}$$

Question 4

A mass-spring system oscillates vertically with a frequency of 2.8 Hz, an amplitude of 8.01 meters, and a midline at $y = -6.83$ meters. At $t = 0$, the mass is at the midline and moving down. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -8.01\sin(2\pi 2.8t) - 6.83$$

or

$$y = -8.01\sin(5.6\pi t) - 6.83$$

or

$$y = -8.01\sin(17.59t) - 6.83$$